surveys, the journal is of the highest interest for its careful and precise account of the physical aspects of the country, its climate, crops, communications, &c.

The period covered by the journal is from May, 1764, to March, 1767. Rennell had just received a commission as probationer engineer in the fort then being erected at Calcutta, near Fort William, and was ordered on May 6 to make a survey of the Ganges eastward of Jelenghee, in order to find out the nearest passage from the Ganges to Calcutta in the dry season, and to report fully on the appearance and products of the country passed through to Mr. Vansittart, the Governor of Bengal. This journal was then kept in pursuance of the Governor's orders, and in it we find daily notes on the weather, the width and depth of the river at high and low water, with many notes on the navigability of the channels traversed, until August 4, when the expedition came to an end.

Six weeks later he started on a second expedition to survey the Ganges from the point reached in the former expedition as far as Dacca, where he was taken ill. As soon as he had recovered he carried his survey to the junction of the Meghna and the Ganges, which his observations show to have then been about a degree farther north than it now is. This expedition ended in May, 1765, and besides carrying out his own surveys, we see from the "Journal" that he was also occupied in collecting from others all such material as would be of service in compiling a general map of Bengal. After two months engaged in surveying on the Meghna and Brahmaputra Rivers the "Journal" passes to the fourth expedition undertaken at Lord Clive's orders in order to form a general map of Bengal, for which distances were to be taken in a cursory manner, only latitudes being used to correct them. In February he was seriously wounded in a fight with a body of Sanashi fakirs, and incapacitated from work until June, but so effectively had he pushed on his survey that on Lord Clive's sudden departure at the end of January, 1767, Rennell was able to supply him with a map of Bengal and a part of Bahar, and another of the Ganges from Patna to Kananj, on the scale of 10 miles to one inch. On January 1, 1767, he notes that he was appointed Surveyor-General, and mentions the four officers who were appointed as his assistants, among whom he apportioned the country to be surveyed.

A large collection of itineraries, latitudes, observations for magnetic variation, and various memoranda complete the volume, which gives a vivid picture of the conditions under which the first surveys in India were carried out. At this time few instruments of precision were available, and his surveys were made with a compass and the chain, while he employed a Hadley's quadrant for the determination of latitudes. Even with such simple equipment he worked with remarkable accuracy, and many places fixed by him are found by subsequent measurement to agree closely with their true positions, though his instruments left much to be desired, as errors of 6 and 8·5 inches in his chain length, which are recorded among the memoranda of his "Journal," show. It was no doubt his own skill in carrying out route surveys and controlling them by astronomical observations that prejudiced Rennell at first against Major Lambton's procedure of triangulation.

The "Journal" is a record of the highest interest, and geographers are much indebted to the editor for his labours, and to the Asiatic Society of Bengal for publishing it, together with a map of Bengal and Bahar from Rennell's "Bengal Atlas" to illustrate it.

H. G. L.

NOTES.

A STONE has recently been put up in Teddington Church in memory of Stephen Hales, who, in addition to being a distinguished man of science, was for fifty-one years the faithful vicar of that parish. He died in 1761, and was buried under the tower in what now serves as the entrance to the church. The fact that Hales was so buried was perfectly well known, and it is hard to say why a morning paper should assert that a number of learned men have hitherto sought for his tomb in vain. It was also known that the gravestone was being worn by the feet of Teddington congregations, and this it was that suggested the erection of a mural tablet on which the epitaph might be permanently preserved. The necessary funds were raised by subscriptions from a number of leading botanists. The students attending a course of lectures on the history of botany at University College, London, also materially helped with contributions. The Vicar of Teddington, the Rev. A. Cazalet, has taken a kindly interest in the scheme, and has been good enough to put up the tablet on the wall close to the burial place of Hales. The inscription is as follows:—"Beneath is the grave of Stephen Hales. The epitaph, now partly obliterated but recovered from a record of 1795, is here inscribed by the piety of certain botanists. A.D. 1911. 'Here is interr'd the body of Stephen Hales, D.D., Clerk of the Closet to the Princess of Wales, who was Minister of this Parish 51 years. He died the 4th of January, 1761, in the 84th year of his age.'"

MR. W. LEO BULLER has presented to the Dominion Museum, Wellington, New Zealand, an extremely valuable collection of about 700 Maori ethnological specimens which had been collected by his illustrious father, Sir Walter Buller, the well-known authority on the birds of New Zealand. The benefaction includes a large and representative collection of valuable historical greenstones, including both personal ornaments and weapons; a number of house carvings; a large pataka; a large carved war canoe with all its ornamental fittings, and a small, beautifully modelled light canoe; a collection of stone tools, adzes, &c., including the largest and finest stone adze at present known; a specially valuable collection of Maori garments, two being dog-skin cloaks in a perfect state of preservation, which were acquired in 1838; a number of other objects of Maori workmanship, many of which are of historic interest. In addition to these specimens, the collection will be completed by sending out to New Zealand the objects now in the Imperial Institute collected by Sir Walter Buller. It is difficult to overestimate the value of this donation, and when the gift was announced in the New Zealand Parliament by the Prime Minister it was received by members with expressions of very warm appreciation. We may now anticipate with confidence that the Dominion Government will at last build a museum to house its natural history and ethnological specimens, the value of which cannot be reckoned in money, but which are contained in an inflammable "old shed of a museum." It is satisfactory to know that the new specimens will be under the care of Mr. Hamilton, the director of the Dominion Museum, who has himself made valuable contributions to our knowledge of the arts and crafts of the Maoris.

NEWS has just reached us of the death, on January 12, of M. T. Durand, member of the Royal Academy of Belgium, director of the State Botanic Garden, and general secretary of the Royal Botanic Society of Belgium.

The Academy of Natural Sciences of Philadelphia has awarded the Hayden medal in gold for distinguished work in geology to Prof. J. C. Branner, of Leland Stanford Jr. University, U.S.A.

The Royal Geographical Society has arranged for a course of three lectures on "The Desert of North Africa," to be given by Captain H. G. Lyons, F.R.S., in the Theatre, Burlington Gardens, on February 9, 13, and 15.

An official intimation from the Musée National d'Histoire Naturelle de Buenos Aires informs us that Dr. Angel Gallardo has been appointed director of that institution in succession to Dr. Florentino Ameghino, who died on August 6, 1911, at fifty-six years of age.

At the ordinary scientific meeting of the Chemical Society held on Thursday, January 18, the president, Prof. Percy F. Frankland, F.R.S., announced that the Moissan memorial lecture will be delivered in the rooms of the society by Sir William Ramsay, K.C.B., F.R.S., on Thursday, February 29, at 8.30 p.m.

So much interest has been aroused by the exhibition of bird tables and nesting-boxes in the offices of the Selborne Society at 42 Bloomsbury Square, W.C., that it has been decided to allow the collection to remain on view until January 31. The hours are from 11 a.m. to 5 p.m. on weekdays, except Saturday, when the exhibition closes at 3 p.m.

It will be remembered that M. Maurice Maeterlinck last year received the Nobel prize for literature. The prize amounted to 7772*l*. We learn from the *Revue Scientifique* that M. Maeterlinck proposes to raise the sum to 8000*l*., and to employ it to establish a biennial prize of 640*l*. to be awarded to the author of the most remarkable work—whether on literature, art, or science—published in the French language.

In December last one of the massive sarsen stones still remaining of what is known as Longstone Cove, or Longstones, standing in the ploughed field to the right of the road from Avebury to Beckhampton, which, according to Stukely, formed an adjunct to the Beckhampton Avenue leading to Avebury, fell down. Its weight is estimated to be more than 30 tons. The Wiltshire Archæological Society, through its secretary, the Rev. E. H. Goddard, Clyffe Vicarage, Swindon, now appeals for assistance in raising the sum of about 50*l*. required to re-erect the stone and support it by a concrete foundation, the funds of the society being inadequate to undertake such a work.

We regret to see the announcement of the death, on January 21, in his eighty-second year, of Dr. David Christison, one of the foremost antiquaries in Scotland. From an obituary notice in *The Times* we learn that he was secretary of the Society of Antiquaries of Scotland for sixteen years, from 1888 to 1904. He travelled over a great part of Scotland planning the prehistoric forts and minutely examining them, and the results of his investigations he contributed in many interesting papers to the Society of Antiquaries. About twenty years ago he was Rhind lecturer, and chose as the subject of his course "The Prehistoric Forts of Scotland." These lectures were published in book form. "Early Fortifications in Scotland" was another of his works. In 1867, for the benefit of his health, Dr. Cristison visited Argentina, on which he wrote a number of papers. A keen student of botany, he was a member of the Botanical Society, to which he made several communications, particularly on the growth of trees.

On Thursday, February 1, Prof. A. M. Worthington will begin a course of two experimentally illustrated lectures at the Royal Institution on "The Phenomena of Splashes," and on Saturday, February 3, Sir Alexander C. Mackenzie will deliver the first of a course of lectures, with musical illustrations, on (1) "Russian Music of To-day," and (2 and 3) "Franz Liszt (Centenary)." The Friday evening discourse on February 2 will be delivered by Sir James Mackenzie Davidson on "Vital Effects of Radium and other Rays," and on February 9 by Dr. J. A. Harker on "Very High Temperatures."

The Liverpool excavations at Meroë, under the direction of Prof. Garstang, assisted by Mr. Schliephack, are making great progress. The palace of the Ethiopian kings, near the temple of Amon, proves to contain more than forty chambers and a large court. On the foundation-walls are reliefs of the usual Ethiopian pattern. Three hundred Sudani natives are now employed, with a staff of trained Egyptian diggers, chiefly fellâḫîn from Ḳuft. A light man-tramway, of the kind commonly utilised in excavations elsewhere (*e.g.* at Abusir and Deir el-Bahari) to facilitate the removal of the excavated material, has been installed, and to this Mr. Garstang has added a small aërial cableway. A telegram from Khartûm describing the progress of the work appeared in *The Times* of January 17; from this the above account is partly taken.

At the annual general meeting of the Royal Meteorological Society on January 17 the president, Dr. H. N. Dickson, presented to Prof. Cleveland Abbe, of the U.S. Weather Bureau, Washington, the Symons gold medal for 1912, which had been awarded to him in consideration of his distinguished work in connection with instrumental, statistical, and dynamical meteorology and forecasting. The following officers and members of council for the ensuing year were elected at the meeting:—*President*, Dr. H. N. Dickson; *vice-presidents*, R. H. Hooker, R. G. K. Lempfert, H. Mellish, Colonel H. E. Rawson, C.B.; *treasurer*, Dr. C. T. Williams; *secretaries*, F. C. Bayard, Commander W. F. Caborne, C.B.; *foreign secretary*, Dr. R. H. Scott, F.R.S.; *councillors*, W. W. Bryant, C. J. P. Cave, Dr. C. Chree, F.R.S., F. Druce, F. W. Dyson, F.R.S., E. Gold, Commander M. W. C. Hepworth, C.B., R. Inwards, Captain H. G. Lyons, F.R.S., M. de C. S. Salter, Captain A. Simpson, and Sir J. W. Towse.

A memorandum of revised arrangements between the Board of Agriculture and Fisheries and the Board of Education in regard to agricultural education in England and Wales has been issued. It is pointed out that in view of the large additional sums which have become available since 1909 for the purposes of agricultural education and research under the Development and Road Improvement Funds Act, 1909, the arrangements made in 1909 now require some modification. It no longer appears possible to delimit the spheres of work of the two Boards by assigning to the Board of Agriculture the responsibility for the universities and colleges in which advanced work is being done, and to the Board of Education the responsibility for farm schools and such other provision for agricultural education as is on a lower plane than that of agricultural colleges. It has therefore been decided that, in future, the responsibility for farm institutes, as well as for the agricultural work of universities and colleges, shall be transferred to the Board of Agriculture, and that this Board shall be regarded as the Government department concerned with this branch of educational work for the purposes of the Development Fund. The application for an advance from the Development Fund in aid of farm institutes, which has been made by the Board of Education, will therefore be withdrawn by them. A fresh application for an advance in aid of farm institutes will in due course be put forward by the Board of Agriculture.

A MEETING of the London Section of the Association of Chemical Technologists will be held at St. Bride's Institute, Bride Lane, Fleet Street, E.C., on Friday, January 26, when a paper will be read by Mr. J. W. Hinchley on the technologist and the factory. The association was inaugurated about a year ago, and its constitution was decided at a general meeting held on December 11 last. Among the objects of the association are the following:—(1) to extend the study and practice of applied chemistry so as to enable this country to compete industrially on equal terms with the most commercially progressive countries abroad; (2) to promote a wider appreciation of the value to the country of applied chemistry, and to obtain for it the active support and encouragement which, from its great economic importance, it deserves; (3) to promote the growth of a distinct profession of applied chemistry, and thus to place this profession upon such a basis that the applied chemist may be at no disadvantage in comparison with his fellows in allied professions; (4) to effect the cooperation of applied chemists for all matters which may promote their interests; (5) to raise a fund to furnish grants for assisting persons approved by the council to obtain training in applied chemistry at approved institutions or chemical works, either in this country or abroad, and to furnish grants for the prosecution of technical research; (6) to assist members of the association to obtain advice in patent matters. Any further information may be obtained from the secretary, 30 Victoria Street, Westminster, London, S.W.

THE Decimal Association has recently made special efforts to bring the advantages of the metric system more fully before the public. The association is now prepared to find a lecturer and to pay his expenses wherever a good audience can be assured, and it suggests that chambers of commerce, education committees, and trade protection societies will do well to take advantage of this offer. A meeting is to be held on January 26, when Mr. Alexander Siemens will address the London Teachers' Association. A pamphlet circulated by the association shows that in Malta the compulsory adoption of the metric system began on January 1 last. The Central American Republics of Nicaragua, Honduras, Costa Rica, San Salvador, and Guatemala have passed the necessary measures to enforce the metric system as from January 1, 1912. China has decided to adopt the metric system. An Act rendering the metric system compulsory in Bosnia-Herzegovina has been passed by the Government of that country, and will come into force on September 1, 1912. The Danish Weights and Measures Act was passed in 1907, and will come into force in April, 1912. The pamphlet points out that the metre and the kilogram are gaining ground in every direction, and that the number of non-metric countries is being reduced steadily; it continues, "the metric system is gradually closing in upon these islands, and it only requires the adoption of the system by one of our great colonies to cause very much more serious attention being given to the subject by the Government of this country."

THE Smithsonian Biological Survey of the Panama Canal zone, begun in December, 1910, and continued through the major part of 1911, is being pushed to completion before the opening of the canal in 1913. The second expedition sailed on January 9 to take up the work for another season, the botanist, Prof. Pittier, being the only naturalist who remained in the field since the beginning of the survey. Although much interesting information has been collected, and a great many specimens secured, nothing like a complete report is ready. The party includes Dr. Seth E. Meek, formerly of the Bureau of Fisheries, but now representing the Field Museum of Natural History; Mr. S. F. Hildebrand, of the Bureau of Fisheries, who will collect fishes, reptiles, and amphibians; Mr. E. A. Goldman, of the Biological Survey, Department of Agriculture, who will collect birds and mammals; and Prof. Charles D. Marsh, of the Bureau of Plant Industry, Department of Agriculture, who will collect and study the microscopic plant and animal life of the fresh waters of the zone. As can readily be imagined, the life-areas on the zone will become confused as soon as the canal is opened and the waters of the Pacific and Atlantic watersheds are intermingled. It is particularly important on that account that the present geographical distribution of animals and plants be recorded prior to that time, and this is especially true as regards the life of the fresh waters and the sea-coasts. The work of the survey is being carried on through the united efforts of the Smithsonian Institution, several of the U.S. Government departments, and the Field Museum of Natural History of Chicago, and the hearty cooperation of the Panama Canal Commission has been an important factor in the success of the undertaking.

THE U.S. Bureau of American Ethnology is preparing a new work which will form a handbook of aboriginal remains in the United States, and will have to do with the ancient abodes, camps, mounds, workshops, quarries, burial places, and so on of the Indian tribes. Letters of inquiry are being sent to all persons, institutions, and societies thought to have any knowledge of American archæology and ethnology. In 1891 a catalogue of prehistoric works east of the Rocky Mountains was published, but that work is both out of date and out of print. The parts of the United States most densely populated by the aborigines must have been the basins of the Mississippi and Ohio Rivers and the southern shores of the Great Lakes, although there are indications of many settlements on the Atlantic coast, especially in Florida. The history of the American Indians forms an attractive subject of inquiry, but the data available are rapidly decreasing. The fact that the customs, folk-lore, and traditions of these people are being lost through advancing civilisation, and that the older Indian authorities and characters are rapidly passing away, makes it more and more difficult to preserve the history of the Indians for future generations. Through the thorough methods of the Bureau of American Ethnology, devoted to the recording of the habits, customs, and history of the American Indians, many valuable data are, however, constantly being compiled.

ANTI-TYPHOID vaccination by means of a vaccine prepared with killed cultures of the typhoid bacillus, as a preventive of typhoid fever, has of late been extensively practised. Last year a French commission reviewed the results obtained, and recommended its adoption in certain circumstances. In the "Report on the Health of the Army for 1910," recently issued, it is stated that on December 31, 1910, out of 71,623 European troops in India, no fewer than 58,481, or 81·7 per cent., had been vaccinated, some once, some twice, some more than twice. Of 335 cases of typhoid occurring in the Indian Army in 1910, 187 were inoculated men and 148 were not inoculated men. Twenty-two deaths occurred among those inoculated and twenty-four deaths among those not inoculated. The ratio per 1000 of strength of admissions for enteric fever among the inoculated was 3·19, and the corresponding ratio of deaths was 0·37. Among the not inoculated the admission ratio per 1000 of strength was 12·72, and that for deaths was 2·06. As regards case mortality, the percentage figures are 11·23 for the inoculated and 16·89 for the not inoculated. There thus seems to be a very strong case in favour of anti-typhoid vaccination.

IN *The Field* of December 30, 1911, Mr. Lydekker suggests that the so-called unicorn rams of Nepal, of which living examples were exhibited a few years ago in the Zoological Gardens, are an artificial product. Mr. Lydekker's views are, however, disputed by Mr. Pocock in the same journal of January 13. In *The Scottish Naturalist* for January Mr. H. J. Elwes gives the first instalment of notes on the primitive sheep of the Scottish islands, dealing in this instance mainly with those of the Shetlands. The paper includes illustrations of a ram and a ewe of the short-tailed Soay, or Soa, breed, which is perhaps the most primitive of all.

PALÆOBOTANISTS are well served by the publication "Die Palaeobotanische Literatur,' of which the second volume, compiled, as was the first, by Dr. W. J. Jongmans, has been published by Gustav Fischer, Jena (price 18 marks). This volume catalogues contributions issued in 1909, and contains also a few papers of the previous year. The first section provides a bibliography; the second section, forming the main portion of the work, presents an alphabetical list of references for families, genera, and species.

Two important contributions to the flora of Siam were published last year. A systematic catalogue, appearing in the *Beihefte zum Botanischen Centralblatt* (vol. xxviii., part ii.), deals with the plants collected by Dr. C. C. Hosseus in 1906. It amplifies the list communicated by the author to the preceding volume by the incorporation of new identifications; among the latter, the family Orchidaceæ attracts attention on account of numerous new species and the large number of species of Dendrobium. A more comprehensive list is that provided by Mr. W. G. Craib, who has worked out the collections of Dr. Kerr and officers of the Siam Forest Service, and has embodied his determinations of the dicotyledonous plants in the first and last numbers of *The Kew Bulletin* (1911). This enumeration indicates a preponderance of species in the families Leguminosæ, Euphorbiaceæ, Rubiaceæ, and Acanthaceæ; the Cupuliferæ consists of twelve species of Quercus and four of Castanopsis; new species are abundant.

THE experimental trials of different varieties of sugar cane that have been maintained in the Leeward Islands for eleven successive seasons furnish each year new facts or premises. The latest report, for 1909–10, bears testimony to the value in Antigua of the established variety, Sealy Seedling, and a seedling introduced recently from Barbados; similarly, an older and a new variety, different from the two former, have yielded the best returns in St. Kitts. It has been recognised that the results of the experimental trials must not be too hastily followed up on the sugar estates; there has certainly been no precipitate change in Antigua, where White Transparent still occupies two-thirds of the total acreage; in St. Kitts, however, a seedling introduced in the earlier trials has displaced that standard variety from the premier position. An increase in the amount of root disease caused by the fungus *Marasmius sacchari* is noted, for which rotation with cotton is suggested as a remedy. The manurial experiments recorded in a separate part are now confined to ratoon canes; the new fertilisers, nitrolim and nitrate of lime, were introduced for the first time.

A COPY of the report for the year 1911 of the Philosophical Institute of Canterbury, N.Z., has been received. During the year the membership reached its highest for many years, and the financial position of the institute is very satisfactory. The report points out that the council of the institute has considered it a duty constantly to urge the importance of preserving the native fauna and flora of New Zealand, and when it was suggested recently that Kapiti Island, one of the Dominion's sanctuaries, could with advantage be used as a holiday resort for Wellington, representations were made to the Government as to the retrograde nature of the proposed step, and the council has had the satisfaction of eliciting from the acting Minister of Lands a statement that it is not intended to interfere with the position of the island as a sanctuary. The council has also urged on the Government the desirability of using the s.y. *Terra Nova* in investigating the biological and hydrographical problems of the New Zealand continental shelf. Its representations have not been accepted, but it is to be hoped that the work which has been done by the *Terra Nova* in the waters immediately to the north of New Zealand may result in substantial additions to scientific knowledge of the marine fauna of that area, as well as conduce to the safety of shipping between Australia and this country. The president of the institute for the present year is Dr. L. Cockayne, and the honorary secretary Dr. C. Coleridge Farr.

THE summary of the weather for the week ending January 20, issued by the Meteorological Office, shows that the conditions were generally unsettled throughout the period. Heavy falls of rain, sleet, or snow occurred in every part of Great Britain. The aggregate rainfall was in excess of the average over the entire kingdom, except in the north of Scotland and the north of Ireland, the excess being large in most parts of England and in the west of Scotland. In the northern and Midland counties the precipitation was chiefly snow. At Southport the depth of snow on the morning of January 17 was 7 inches, whilst a similar quantity was reported next morning at Cirencester, and a depth of 8 inches at Bath. In the south and south-east of England the fall of snow was very slight. There was a decided rise of temperature towards the close of the week, and the snow rapidly disappeared. The melted snow, combined with the copious rains, occasioned floods in many parts of the country. At the end of the week the large European anticyclonic system, which had extended from Siberia to Norway, and at the centre of which the barometer was above 31 inches, had decreased considerably in intensity. For the time the threatened cold spell had disappeared, and damp and mild weather had again set in.

IN a memorandum dated Simla, December 11, 1911, referring to the probable character of the rains from December, 1911, to February, 1912, in northern India, the officiating director-general of observatories explains that the falls during the winter season occur during the passage of disturbances which have been shown to reside in the upper and middle strata of the atmosphere. When these depressions show themselves, their line of travel varies considerably from year to year, and it is chiefly owing to this fact that the rains at that season are so variable and erratic. The present knowledge of the upper air currents is scanty, and it follows that forecasts of the winter rains are considerably more tentative than those for the monsoons. On the basis of the history of past years which have shown a general similarity with 1911 in respect of meteorological statistics during October and November, it is estimated that the geographical average of the rains in question is not likely to be in defect in northern India; an excess is probable in the Punjab and the west of the United Provinces, but there may be a defect in Gujarat and Sind. The amount of snowfall in the west Himalayas may be expected to be above the normal.

POURING oil on troubled waters as a proverb is well known. The actual use of oil at sea for preventing waves from breaking is known, but not so universally. Messrs. Loveridge, Ltd., of The Docks, Cardiff, are supplying a convenient device for utilising oil economically. This is Couves's automatic "wave subduer." A cylindrical vessel containing a heavy piston is fixed in the ship near the bow, and a little above the water-line. Two narrow pipes pass from the bottom of this through the plating, one on either side of the stem, and these pipes are normally closed by taps. The vessel is filled with oil, and the piston is raised by a central screw. It is then ready at any moment to drive the oil through one pipe or both when the proper taps are opened. The amount of oil used per hour appears from a letter by a user to have been in his case about half a gallon only. Being only applied at the bow, the oil does not have time to do much to the waves that break over the bows, but, even so, it appears to have a marked effect further aft, that is, when meeting a heavy sea. With a following wind, however, the trail of oil would seem to be much more efficacious, and the great risk of being pooped at such times is no doubt greatly diminished.

THE application of "flashlight" photography to living microscopical organisms is discussed by Mr. Walter Bagshaw in the Journal of the Royal Microscopical Society for December, 1911, who points out the advantage, especially in photographing pond life, of using living instead of mounted specimens. Mr. Bagshaw has experimented on *Lophobus crystallinus*, caddis flies, water shrimps, &c., though he has not yet succeeded in photographing darting or rapidly moving objects. The "flashlight" powders give a total exposure of one-thirtieth of a second, irrespective of the quantity used. The best instant for exposure was determined by illuminating the object with a faint side-light and observing it through a hand magnifying glass. Should the method be brought into general use, there appears no reason why an apparatus should not be constructed which would enable the object to be viewed through the microscope and focussed up to the instant of exposure, as in the reflex camera. The same number of the Journal contains two interesting papers dealing with the optical resolution of minute structures, one by Mr. T. W. Butcher on the structural details of *Coscinodiscus asteromphalus*, the other by Mr. James Strachan on the scales of *Thermobia domestica*, an ally of the well-known *Lepisma saccharina*.

THE first number has been received of the Journal of the Association of Teachers of Mathematics for the South-eastern Part of England, which is to be published three times a year. It contains the presidential address delivered at the inaugural meeting at Tonbridge on November 24, 1911, by Dr. A. N. Whitehead, F.R.S., on "The Place of Mathematics in a Liberal Education." The new association consists of nearly fifty members, more than half of whom are women engaged in school teaching in the district in question, the secretary being Mr. G. St. L. Carson. It is intended to promote common action and unity of purpose among school teachers of all grades, including those only engaged in teaching arithmetic. The question may be asked, why is it not affiliated to the Mathematical Association? Mr. Carson, however, points out that England is almost alone in preserving an unnatural separation between the professed mathematician and the teacher of elementary mathematics, and he hopes the association may help towards bridging this chasm. In Dr. Whitehead's address we note several interesting suggestions, in particular he emphasises the view that modern education should be based more on a study of modern civilisation and less on that of the civilisation of the Greeks and Romans. In order to effect this object Dr. Whitehead would include in elementary mathematics exercises based on the statistics of modern commerce and politics. If this proposal should do anything to convince a future generation that modern politics ought to be treated as a science and made the subject of qualifying tests similar to those required for admission to learned professions, a useful purpose would be served.

ACCORDING to a reprint from the November (1911) number of the Proceedings of the American Academy of Arts and Sciences, Mr. E. L. Chaffee, of the Jefferson Physical Laboratory of Harvard, has devised a system which produces undamped electrical oscillations of extremely high frequency with greater regularity than any of the systems at present in use in wireless telegraphy or telephony. In principle, the method stands intermediate between the methods of Poulsen and of Wien. A direct-current generator of 530 volts is connected through variable resistances and inductances, and through the primary coil of a closely coupled oscillation transformer, to the oscillation gap. This consists of two parallel plates of one or two square centimetres area 0·07 millimetre apart, the anode being of copper or silver and the kathode of aluminium. Both anode and kathode are water or air-cooled, and are surrounded by moist hydrogen at atmospheric pressure. The primary of the transformer and the spark-gap are shunted by an air condenser, and another is placed in series with the secondary of the transformer. Both admit of variation to secure syntony. A thorough examination of the secondary oscillations has been made by means of the Braun tube oscillograph.

So much of the recent work on the properties of electrons depends on Stokes's law of resistance to the motion of a sphere in a viscous fluid, that careful tests of the validity of the law have become essential. According to a reprint from vol. xxxvi. of the *Annalen der Physik*, Prof. Knudsen and Dr. Weber, of the University of Copenhagen, find the law requires modification for small spheres moving through a gas, especially if the pressure of the gas is low. Their method depends on the observation of the logarithmic decrement of the torsional oscillations of a light rod 16 centimetres long with or without light glass spheres of a few millimetres diameter at its ends. The oscillating system was placed in an enclosure which could be evacuated, and observations were taken in air at pressures from 0·14 to 1 million dynes per square centimetre. The resistance to a sphere of radius r moving with velocity v through a gas of viscosity η is equal to

$$6\pi\eta r v/(1+0{\cdot}68l+0{\cdot}35le^{-1{\cdot}84/l}),$$

where l is the mean free path of the molecules of the gas divided by the radius of the sphere. It will be seen that the result involves an exponential term not given by the theoretical investigation of Cunningham or the experimental work of McKeehan, although the authors show that there is some indication of its effect even in the observations made by the latter.

A LECTURE, under the auspices of the Graham Lecture Fund was delivered on Tuesday, January 16, in the hall of the Technical College, Glasgow, by Prof. H. E. Armstrong, F.R.S. The lecture was arranged by the Royal Philosophical Society, and the subject selected was "Some Consequences of Graham's Work." The lecturer was dealing with a subject on which he was specially qualified to speak when he described the way in which Graham's work on diffusion had been developed in recent years. The effects produced by non-electrolytes, which are able to penetrate the membranes of living cells, and so to set going important physiological processes, are now recognised as factors of vital importance in the life and development of plants and animals; it was therefore a happy inspiration on the part of the trustees of the Graham Fund to secure from Prof. Armstrong himself a description of the experiments which have done so much to bring home to the physiologist, as well as to the chemist, the important results which have followed upon the pioneer work of Graham.

AN interesting study of the localisation and function of potassium in plants, by Dr. Th. Weevers, is contained in the *Recueil des Travaux botaniques Néerlandais* (vol. viii., p. 289), use being made of Macallum's very delicate microchemical test, based on the precipitation of potassium cobalt nitrite and subsequent conversion of this into black cobalt sulphide by treatment with ammonium sulphide. In a very large number of plant tissues tested, potassium was found always to be present, save in the Cyanophyceæ. In all cases the cell nucleus, however, contained no trace of this element, even in cases when the cytoplasm contained this element in abundance. Special experiments showed that this result was due neither to potash salts diffusing out of the nucleus under the treatment, nor to inability of the reagent to penetrate therein. The larger portion of the potassium is contained in the vacuoles of the cells, the chromatophores being free from it; chlorophyll also contains no potassium. In all cases tested the potassium was present in a form soluble in water, and can be extracted practically completely from the cell by water or 50 per cent. alcohol, but it seems to be insoluble in ether. In phanerogamous plants the potassium is most abundant in the parenchyma, especially in the growing points and reserve organs. In the secondary tissues potassium predominates in the living elements of the wood and bark, especially in the cambium and medullary rays; the latter seem to act as potash reserves for the growth of new shoots. In discussing the physiological significance of potassium in the plant, it is considered that this element plays little or no part in carbon assimilation, but probably is concerned more in building up protoplasm at growing points. In the leaf it probably functions in synthesis and degradation of the protein.

MESSRS. WITHERBY AND CO. are about to publish "The Game-birds of South Africa." The book is by Major Boyd Horsbrugh, and will be illustrated by nearly seventy coloured plates reproduced in facsimile from the drawings of Sergeant C. G. Davies. The work will be in small quarto, and will be issued in four quarterly parts.

OUR ASTRONOMICAL COLUMN.

SCHAUMASSE'S COMET, 1911*h*.—In the *Comptes rendus* for January 8 (No. 2) M. G. Fayet announces his tentative conclusion that the comet discovered by M. Schaumasse at Nice on November 30, 1911, is a periodic comet with a period of about seven years. A parabolic orbit first calculated showed such digressions from the observed places that an elliptic orbit was tried which gave satisfactory O–C differences for intermediate positions. The preliminary elements, determined from positions observed at Nice on December 1, 11, 16, and 21, 1911, are as follows:—

$$T = 1911 \text{ November } 12{\cdot}2440 \text{ M.T. Paris.}$$

$$\left.\begin{aligned} \pi &= 136^\circ\ 33'\ 37'' \\ \Omega &= 93^\circ\ 14'\ 32'' \\ i &= 17^\circ\ 40'\ 46'' \end{aligned}\right\} 1911{\cdot}0$$

$$\begin{aligned} \log q &= 0{\cdot}084487 \\ e &= 0{\cdot}675480 \\ \mu &= 489{\cdot}938'' \end{aligned}$$

The data are, of course, too meagre for any certainty to be claimed for these elements, but it is worthy of notice that on December 28 the departure of the observed place from M. Fayet's ellipse was only 15″.

THE DISTRIBUTION OF BRIGHTNESS IN THE TAIL OF HALLEY'S COMET.—Some important results concerning the nature of the particles in the tail of Halley's comet, and of their illumination, are obtained by Drs. Schwarzschild and Kron in a paper of which a translation is printed in No. 5, vol. xxxiv., of *The Astrophysical Journal*. The material for the discussion was provided by plates secured by the Potsdam Observatory expedition to Teneriffe to observe the comet.

The photographs were secured in pairs, and photometric standards for comparing the density of the image were produced simultaneously; the photographs show that the apparent intensity of the tail diminishes continuously from the head outward. This diminution might be produced by two causes, first the decrease in density of the tail matter, secondly by a decrease in the actual luminosity of the individual particles; decrease in density would be produced by increase in cross-section of the tail as units further from the head were considered, and by the greater velocity of the particles through each section produced by the solar acceleration.

The density effect was very carefully calculated by the authors, and, to their surprise, was found to account, in the most part, for the decrease of brightness. It should be remembered, however, that several unknown quantities enter into the conditions discussed. This result, if legitimate, can be explained by assuming that the light of a comet's tail is a kind of fluorescent or resonant radiation excited by the solar radiation. On this basis they calculate the amount of matter passing through a unit section, and also the density, and find that, exposed for a whole day to the conditions obtaining at the time of its passage through the tail, the earth would not collect more than 250,000 kilograms of cometary matter, a relatively insignificant amount.

OBSERVATIONS OF PLANETS.—In No. 4548 of the *Astronomische Nachrichten* is published a telegram, received from Prof. Lowell on January 12, announcing that since the last presentation the canal Titan on Mars has doubled.

M. Jarry-Desloges reports that the south polar cap reappeared, as two distinct masses, on January 3, and that the abnormal white streak at the north pole going south between Propontis and Palus Mæotis, had completely disappeared on that date.

The latter also states that on December 29, 1911, at 23h. 30m., the south polar regions of Saturn were covered by a well-defined dark area having an equally well-defined greyish area at its centre; taking the equatorial diameter of the planet as unity, the respective diameters of these patches were 0·31 and 0·11. At 23h. 15m. the same evening the eastern anterior portion of the rings appeared very notably darkened, but the phenomenon did not endure more than twenty-four hours. The farther eastern section of the exterior ring, as compared with the Cassini division, was also darkened. At this time the inner transparent